REMARKS

Claims 1 and 3-12 are pending in the application. Claims 1 and 11 have been amended, claim 2 has been cancelled, and claim 12 is newly added to the application. No new matter has been introduced by the amendment.

Rejection Under 35 U.S.C. § 103(a)

Claims 1-5 and 8-9 have been rejected over Chou in view of Sun et al. This rejection is overcome in view of the amendment of claim 1, together with the following remarks.

Claim 1 has been amended to include the limitations of dependent claim 2. Accordingly, the applications assert that a new search should not be required to examine the merits of amended claim 1.

The applicant's specification acknowledges the use of multi-layers with curing in print lithography of the prior art. (See Specification, pg. 4, ll. 9-25). Further, the use of lift-off techniques in the prior art is also acknowledged. The applicants succeed over the prior art by providing an inner layer of cured material that has sufficient hardness to be used as a stop layer, and, once patterned, the external layer and the inner layer can be used as an etch mask for the etching the substrate. (See Specification, pg. 6, ll. 18-29).

As previously asserted by the applicants, Chou does not disclose an internal sub-layer, as recited in claim 1. Sun et al. disclose imprint lithography processes that use a multilayer resist. In one process, a tri-layer resist that includes a PMMA bottom layer, a silicon dioxide middle layer, and a polystyrene top layer is applied to a substrate. (Cols. 1-2, pg. 3922). Since the glass transition temperature of the polystyrene top layer is lower than that of the PMMA, the PMMA is not deformed during the printing process. A mold is pressed into the top layer to form a pattern, then the silicon dioxide layer is etched. Finally, a second etch process is used to etch the PMMA layer using the silicon dioxide layer as an etch mask.

In another process disclosed by Sun et al., a novolak resin is applied on a substrate, and a PMMA layer is applied on the novolak resin. (Col. 2, pg. 3922, Col. 1, pg. 3923). It appears that the novolak resin is baked, but very little detail is provided.

The glass transition temperatures of the two materials is such that the bottom layer will not be deformed when the mold is pressed into the top layer. A chrome layer is deposited onto the PMMA and a metal lift off is carried out. The novolak resin layer is then etched using the metal as a mask.

In other multi-layer resist processes disclosed by Sun et al., after patterning the top layer, a roll-on layer is applied or a second resist layer is applied. The applied layers are then used as an etch mask to etch the underlying layer.

In another process shown in FIG. 1(C), a pattern is formed in a top polystyrene layer and transferred to an underlying PMMA layer. (Cols. 1 and 2, pg. 3923). Sun et al. do not disclose curing the PMMA layer nor etching the substrate.

The applicants assert that neither of the cited references suggest or disclose using a patterned upper layer to directly pattern a cured, inner layer. Nor do they use a patterned, cured, inner layer to etch the underlying substrate. Chou uses a single layer, and the processes disclosed by Sun et al. employ an oxide layer or a metal layer as an etching mask to etch the underlying layer. Further, once the oxide layer or the metal layer or one of the applied layers are used to pattern the underlying layer, Sun et al. do not the etch substrate. Accordingly, claim 1 is allowable over these references.

As set forth above, the limitations of claim 2 have been introduced into amended claim 1. In rejecting claim 2, the Examiner asserts that Chou discloses etching the substrate, (Office Action, pg. 4). The applicants respectfully assert that this interpretation is incorrect. The referenced text of Chou describes contact by the mold with the PMMA film (20) and does not disclose etching the substrate. While Chou alludes to reproducing a pattern in the substrate (see for example, Abstract), neither Chou nor Sun et al. disclose etching the substrate using a patterned, curred inner layer of a multi-layered resist.

Claims 3-5 and 8-9 are allowable at least in view of the amendment and remarks pertaining to claim 1 from which they depend.

Claim 6 has been rejected over Chou and Sun et al. in combination with Pavlinec et al. This rejection is overcome in view of the amendment and remarks pertaining to claim 1, from which claim 6 depends. Further, the applicants assert that the addition of Pavlinec et al. does not overcome the deficiencies of Chou and Sun et al. None of

these references suggest or disclose pressing protrusions of a mold into an external sub-layer until the protrusions contact an underlying, cured, internal sub-layer. Then, etching the internal sub-layer and etching the substrate, thereby transferring the mold pattern to the substrate.

Claims 7 and 10 have been rejected over Chou and Sun et al. in combination with Pavlinec et al. and Allen et al. This rejection is overcome in view of the applicants' foregoing remarks pertaining to claim 1, from which claims 7 and 10 depend. The applicants assert that the press lithography of Sun et al., the disclosure of cross-linking polymers by Pavlinec et al., and the disclosure of various characteristics of resist materials by Allen et al. do not overcome the deficiencies of Chou. This is at least because none of the cited references, taken alone or in combination, suggest or disclose the applicants' lithographic method recited by claim 1.

Claim 11 has been rejected over Sun et al. and U.S. patent application 2002/0042027 to Chou et al. This rejection is overcome in view of the amendment of claim 11, together with the following remarks.

Claim 11 has been amended to recite a lithographic method that includes forming a first layer of curable material in contact with a substrate surface, and curing the first layer. A second layer of deformable material is formed on the first layer and a mold is pressed against the second layer. Protrusions in the mold form recesses in the second layer that expose portions of the first layer. The first layer is etched using the second layer as an etch mask, and the etch exposes surface regions of the substrate. In similarity with claim 1, the surface regions of the substrate are then etched using at least the first layer as an etching mask.

In rejecting claim 11, the Examiner asserts that Chou et al. shows that PMMA is deformable and that Sun et al. use PMMA in their disclosed process. The Examiner further asserts that Sun et al. disclose etching the substrate, however, this is incorrect. (Office Action, pg. 7). In the text cited by the Examiner, Sun et al. disclose etching the novolak resin, not the underlying substrate.

New Claim

Claim 12 has been newly added in order that the applicants can more fully claim the subject matter of their invention. As disclosed by the applicants, forming the internal and external sublayers of the same material provides a simplified process. (Specification, pg. 6. ll. 30-35, pg. 7. ll. 1-2). The applicants assert that the cited references do not suggest or disclose the lithographic method recited by claim 12. Although Sun et al. disclose using a second layer of undefined composition in the processes shown in FIGs. 1(D) and 1(E), the bottom layer is described as a planarization layer and the second layers are not patterned using a mold. Accordingly, none of the cited references suggest or disclosure using the same material for both the upper layer and the inner layer, as recited by claim 12.

The applicants have made a novel and non-obvious contribution to the art of lithographic methods. The claims at issue distinguish over the cited references and are in condition for allowance. Accordingly, such allowance is now earnestly requested.

Respectfully submitted,

/Jasper W. Dockrey/
Jasper W. Dockrey
Registration No. 33.868
Attorney for Applicants

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
CHICAGO, ILLINOIS 60610
(312) 321-4200